equal in importance to the discovery of the microscope itself. And embryology, far more than any other department of morphology, depends upon this art; indeed, the study may be almost said to date from the introduction of this method of inquiry. Hence there is a strong bias in favour of representing structures in section; and in original papers and advanced treatises this custom is not to be deplored, for the reader knows exactly what is meant by the figures. But even in such works I think that the reader, and the author also, would benefit by the introduction of a few additional illustrations representing the organism, organ, or structure, as a solid object. But there can hardly be two opinions on this subject in the case of an introductory text-book. The beginner cannot readily or correctly reconstruct in imagination the solid structure from a representation of a section, and he must infallibly lose considerably in time by the prevalent custom of representing in only two dimensions objects which really exist in three. Long descriptions might be curtailed, and great additional clearness conferred by the frequent illustration of solid objects, out of which a small portion is represented as cut, on one side only, so as to show the internal structure. But this necessity is not fully recognized in any embryological text-book, although some attempt is made to deal with it in this and in other works. It is to be hoped that in future editions considerable attention may be paid to this mode of illustration, which will be more than repaid by the advantage conferred upon the young student.

In conclusion, the author seems to have included everything of importance in his subject up to the date at which the book was written; so that many important discoveries or theories are described which are necessarily absent from Balfour's work. When from the necessities of space these are only briefly touched upon, the reference to the original papers is to be found in Appendix B., containing a bibliography of recently published works on embryology Hence there is reason to hope that the volume may be found useful to the student who is familiar with Balfour's work.

E. B. P.

SOME MATHEMATICAL BOOKS.

The Conic Sections, with Solutions of Questions in London University and other Examination Papers. By G. Heppel, M.A. (London: Baillière, Tindall, and Cox, 1887.)

A New Mode of Geometrical Demonstration, with Examples showing its Application to Lines and Angles, Surfaces, and the Products of Three or more Straight Lines, &c. By D. Maver. (Aberdeen: A. Brown, 1887.)

Easy Lessons in the Differential Calculus: indicating from the Outset the Utility of the Processes called Differentiation and Integration. By R. A. Proctor. (London: Longmans, 1887.)

First Steps in Geometry: a Series of Hints for the Solution of Geometrical Problems, with Notes on Euclid, useful working Propositions, and many Examples. By R. A. Proctor. (London: Longmans, 1887.)

MR. HEPPEL'S little hand-book is not a complete treatise on elementary analytical geometry as usually presented to junior students, but it is a sequel to a previous small work in the same series ("Students' Aid Series"), "On the Geometry of the Straight Line and Circle." The object aimed at in the two works is to fully equip readers for the B.A. and B.Sc. examinations of the London University and similar examinations. Hence a limited portion only is discussed, viz. the equations to the conics; tangents, polars, normals, and curvature; sections of a cone, harmonic pencils, and miscellaneous theorems. Though Mr. Heppel has treated his subject concisely, he has not done his work in a perfunctory manner, for there is much originality exhibited in his mode of treatment, and he has discussed the general equation, not only for rectangular axes, but generally, in a very clear manner. If we mistake not, this clear exposition of a somewhat difficult part of the subject—difficult, that is, to junior students—is the outcome of some years' experience in tuition. In an appendix are given "hints to students" founded on this experience, and solutions to questions, illustrative of the text, which have been taken from the London University papers. There are a few errors in the printing, but they are not of a character to seriously inconvenience the student. We could have wished for a larger page, for then more justice would have been done to the author in the presentment of some of the formulæ. A student who carefully reads the text and transfers the formulæ for the separate conics to larger pages, ought to require no other text-book than this small one for the examinations named above.

Mr. Maver claims for his method the recommendation that it is new. One can hardly expect such to be the case, but we certainly do not remember to have come across it as here applied. The nearest approximation we can lay hands upon is the method of parallel transformation, given in Petersen's "Methods and Theories for the Solution of Problems of Geometrical Constructions" (pp. 46–47); but Mr. Maver has worked out the idea at considerable length and in an elegant manner. An illustration from the principles and from the body of the work will sufficiently explain the scope of the method. "Let AB and CD be two parallel straight lines, and AC, GK, and GM any lines whatever drawn from the line AB to the line CD. If these lines, AC, GK, GM, move in the direction of the parallels AB, CD, so that $CF = KL = MD$, then we have the space $CE = KB = GD$ (Euc. i. 36). Let the space CE be represented by sAC, which may be read space generated by AC, and so on; then $sAC = sGK = sGM$." Assuming results which readily flow from the above and which are given in the "Principles," let us now take Example II. The sides AB, BC of a triangle are bisected by CE, AF, cutting in G, to prove $CG = 2EG$, $AG = 2FG$; and if BG produced cuts AC in D, then $AD = CD$. "Let AF be the direction of motion, then $sCG = sCF = sBF = sBA = 2sEA = 2sEG$; $\therefore$ since $sCG = 2sEG$, $CG = 2EG$. In the same way $AG = 2FG$. Again, if DB be the direction of the motion we have $sAD = sAB = 2sEB = 2sEG = sCG = sCD$; $\therefore$ since $sAD = sCD$, $AD = CD$." There are five chapters, viz. one, containing the principles; two, applications to lines and angles; three, to squares and rectangles; four, the products of three or more straight lines; five, to lines that are in the same straight line. In an appendix the author "proves Euc. i. 36

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by the doctrine of motion without any reference to the propositions of Euclid which precede it." In all, the author applies his method to forty-one examples, the treatment of which will present no difficulty to the student. If the method is not thoroughly new, it is true, and offers an interesting field for investigation.

Many of our readers have no doubt made an acquaintance with Mr. Proctor's pages already, as they originally appeared in *Knowledge*. In his preface the author states as his experience :—" I could find no interest in the differential calculus, till, after wading through 200 pages of matter having no apparent use (and for the most part really useless), I found the calculus available for the ready solution of problems in maxima and minima. This little work has been planned with direct reference to my own experience at school and college." In 114 small pages Mr. Proctor very luminously, we think, unfolds the *raison d'être* of the calculus, and by easy yet sure stages carries his reader over a good deal of ground, sufficient for a large class of students. The proofs are clear, and apparently quite level to the comprehension of a student who has a solid, but not necessarily extended, knowledge of elementary mathematics. It is a good introduction to a great subject, and is calculated to entice readers to go on further. Several well-chosen problems are fully worked out, and there are a few others for the student to tackle himself. There are not many errata, but there are slips on pp. 52, 73, 95, 109, and quite a crop on p. 110.

"First Steps in Geometry" is a reprint; it certainly well deserves an extended circulation, especially amongst intelligent mechanics and others who cannot command the assistance of teachers, for they will appreciate the way in which the writer goes about his task. His "method of showing why such and such paths should be tried, even though some may have to be given up, in searching for the solution of problems," is likely to be very suggestive to the thoughtful student. There is a vast quantity of good work in the little book, and the way in which the second book of Euclid is treated ought to find a place in our school text-books.

OUR BOOK SHELF.

The Photographer's Indispensable Hand-book. Compiled by W. D. Welford. Edited by H. Sturmey. (London: Iliffe and Son, 1887.)

THIS book is practically a complete cyclopædia on the subject of photographic apparatus, materials, and processes, &c. Those who intend purchasing articles pertaining to photography cannot do better than look through these pages, where they will find a great amount of useful knowledge and information massed together in one volume.

It would be impossible to describe the various kinds of cameras and processes, &c., which are dealt with here, but we need only add that they are profusely illustrated and well classified.

One of the latest novelties in the way of secret cameras is shown in "the watch," which, when closed, is exactly like an ordinary watch. It is opened by a spring, when a series of about half-a-dozen tubes shoot into position.

A great assortment of the different make and kinds of drop-shutters which at the present time are so largely used for instantaneous work is added.

Ueber Gemüthsbewegungen. Von Dr. G. Lange. Autorisirte Uebersetzung von Dr. H. Kurella. (Leipzig: Theodor Thomas, 1887.)

THE original essay of which this is a German translation is in Danish, and was published in 1885. The author is a Professor of Pathological Anatomy in Copenhagen, and is well known both as a practical physician and as a man of science. He does not pretend to deal fully with the complicated and difficult questions connected with the expression of the emotions. He examines, however, with much care the physical accompaniments of sorrow, joy, terror, and anger; and he offers important suggestions as to the point of view from which the entire subject can be most successfully studied. That emotions are not, in any sense which can be recognized by science, the causes of the physical phenomena associated with them is a proposition on which he lays great stress; and in support of his opinion he presents a number of arguments which deserve the attention of all who are interested in psycho-physiological studies. The German translation is very clear, and will no doubt find readers in England as well as in Germany.

Three Lectures on the Forms of Nasal Obstruction in relation to Throat and Ear Disease. By Greville Macdonald, M.D. (London: A. P. Watt, 1887.)

THESE lectures were originally delivered at the Throat Hospital, Golden Square. They do not constitute a text-book, but the author has embodied in them the results of much inquiry as to various forms of nasal obstruction. The diseases of which he treats are all of common occurrence, yet some of them have hitherto been but inadequately described, and Dr. Macdonald holds that their pathology is often totally misunderstood. His exposition, therefore, should be of service both to the student and to the general practitioner.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

"The Scenery of Scotland."

THE review by Mr. A. H. Green, of Geikie's "Scenery of Scotland," published in your paper of October 13 (p. 553), does not, I think, show any accurate appreciation of the disputable points in that work. The fundamental proposition ascribed to Hutton is "that the surface features of the land are, in the main, due to the carving and sculpturing action of denudation." Mr. Green does not seem to be aware that the truth of this doctrine may entirely depend on the definition of the words "surface features," and of the subsequent words "in the main."

As there is probably no actual "surface" existing in the world which has not been weathered more or less (except the very freshest lavas), the doctrine of Hutton, when so stated, is not only true, but it is a truism. Indeed the words "in the main" might be omitted; because it would be substantially true that all "surface features" in this literal sense are due entirely to denudation.

But if the words "surface features" be understood not literally, as confined to any mere visible surface, but as applying to all forms and shapes underlying mere surfaces, then the doctrine is open to great debate, and the truth of it turns entirely on the breadth of interpretation given to the words "in the main."

Living as I do in the Highlands, I maintain that the forms of

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